

No.

200100256



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

*Western Plant Breeders, Inc.*

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

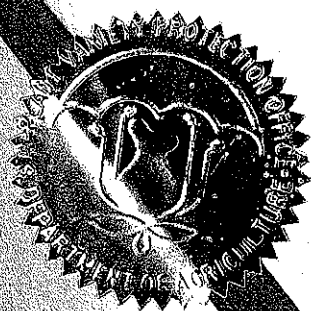
AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Keystone'

*In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this ninth day of April, in the year two thousand two.*



Attest:

*Paul M. Juhel*

Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

*W. G. ...*

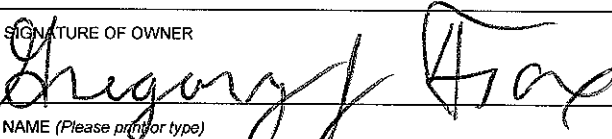
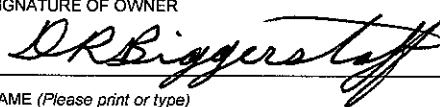
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

**APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE**  
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER <b>Western Plant Breeders, Inc.</b>		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME <b>FA-998-743</b>		3. VARIETY NAME <b>Keystone</b>	
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) <b>8111 Timberline Drive Bozeman, MT 59718-8184</b>		5. TELEPHONE (include area code) <b>(406) 587-1218</b>		FOR OFFICIAL USE ONLY PVPO NUMBER <b>200100256</b> FILING DATE <b>August 10, 2001</b>	
		6. FAX (include area code) <b>(406) 586-8247</b>			
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) <b>Corporation</b>		8. IF INCORPORATED, GIVE STATE OF INCORPORATION <b>Arizona</b>		9. DATE OF INCORPORATION <b>Aug. 24, 1990</b>	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) <b>Dr. Greg Fox Western Plant Breeders, Inc. 717 14<sup>th</sup> Street South Fargo, ND 58103</b>				FILING AND EXAMINATION FEES: <b>\$ 2705.00</b> DATE <b>8/10/01</b> CERTIFICATION FEE: <b>\$ 320<sup>00</sup></b> DATE <b>1/24/02</b>	
11. TELEPHONE (Include area code) <b>(701) 293-5146</b>		12. FAX (Include area code) <b>(701) 293-5146</b>		13. E-MAIL <b>gfox@westbred.com</b>	
				14. CROP KIND (Common Name) <b>Common Wheat</b>	
18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,705), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)			19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act <input type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no," go to item 22)		
			20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED		
			21. DOES THE OWNER SPECIFY THAT THE CLASSES BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1, 2, 3, etc. <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED (If additional explanation is necessary, please use the space indicated on the reverse.)		
22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)			23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)		
24. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.					
SIGNATURE OF OWNER  NAME (Please print or type) <b>Gregory J. Fox</b>			SIGNATURE OF OWNER  NAME (Please print or type) <b>Dan R. Biggerstaff</b>		
CAPACITY OR TITLE <b>Special Projects Breeder</b>		DATE		CAPACITY OR TITLE <b>General Manager</b>	
				DATE <b>7 July 2001</b>	

**GENERAL:** To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for \$2,705 (\$320 filing fee and \$2,385 examination fee), payable to "Treasurer of the United States" (See *Section 97.6 of the Regulations and Rules of Practice*.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 500, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$320 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

**Plant Variety Protection Office**

**Telephone: (301) 504-5518**

**FAX: (301) 504-5291**

**Homepage: <http://www.ams.usda.gov/science/pvp.htm>**

**ITEM**

- 18a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method; (2) the details of subsequent stages of selection and multiplication; (3) evidence of uniformity and stability; and (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 18b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
  - (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
  - (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 18c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 18d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 18e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
19. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (See *Regulations and Rules of Practice, Section 97.103*).
21. See *Section 83 of the Act for the Contents and Term of Plant Variety Protection*.
22. See *Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements*.
23. See *Section 5.5 of the Act for instructions on claiming the benefit of an earlier filing date*.

**21. CONTINUED FROM FRONT** (Please provide a statement as to the limitation and sequence of generations that may be certified.)

**22. CONTINUED FROM FRONT** (Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)

**USA March 2001**

**23. CONTINUED FROM FRONT** (Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)

**NOTES:** It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment or any modification of owner's name is specified in Section 97.175 of the regulations. (See *Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice*.)

To avoid conflict with other variety names in use, the applicant must check the variety names proposed by contacting: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center—East, Beltsville, MD 20705. Telephone: (301) 504-8089.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number for this collection of information is (0581-0055). The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact the USDA's TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

S&T-470 (2-99) designed by the Plant Variety Protection Office with WordPerfect 8.0a. Replaces STD-470 (6-98) which is obsolete.

**"KEYSTONE"**  
Hard Red Spring Wheat

**18.a. Exhibit A. Origin and Breeding History**

Keystone (Exp # FA 998-743) is a hard red spring wheat derived from the cross "Lars" x "Sharpshooter". The F<sub>1</sub>, F<sub>2</sub> and F<sub>3</sub> generations were advanced in growth chambers in 1995-1996. F<sub>4</sub> plants were evaluated in a scab evaluation nursery in Fisher, MN in summer 1996. A single scab resistant plant was selected. The resulting F<sub>4</sub> line was evaluated as F<sub>5</sub> plants in a plot in the 1997 Fisher, MN scab evaluation nursery. A single F<sub>5</sub> plant from that line was selected and advanced as an F<sub>6</sub> bulk in Brawley, CA in winter 1997-1998. The F<sub>7</sub> bulk (designated FA-998-743) was increased/evaluated in Fisher, MN in a scab evaluation/yield trial nursery and harvested in bulk to form Keystone in summer 1998. The F<sub>8</sub> was increased in Brawley, CA in the winter of 1998-1999 as the initial breeders seed increase. In the spring of 1999, a second Breeder's seed increase (F<sub>9</sub>) was conducted at Fisher, MN. Keystone was also evaluated at 5 MN/ND environments in 1999. A final Breeder's seed increase (F<sub>10</sub>) was conducted at Brawley, CA in the winter of 1999-2000. In the spring of 2000, Keystone was evaluated at 7 MN/ND environments. Keystone proved to be both stable and uniform in these increases and evaluations.

Besides being selected for scab resistance, Keystone has been evaluated and selected for suitable agronomic characteristics such as disease resistance (stem rust, leaf rust, tan spot, *Septoria tritici*), and high yield, and suitable quality measured as protein content, and high SDS sedimentation levels (Table 1). Keystone's scab resistance and agronomic fitness were confirmed by the USDA 2000 Uniform Regional

Spring Wheat Nursery (Tables 2-5), and bread making quality by the 2000 Wheat Quality Council trial (Figure 1).

The first Foundation Seed increases were planted in the spring of 2000 in northern MN (Fisher and Sherack, MN) to produce Registered and Certified seed. Certified seed will be first available to growers in the spring of 2001.

A variant that is similar to Keystone but is 10 to 20 cm taller, may be present at a frequency of 1 in 10,000. Up to 10% of these tall variants may be awnless or awnletted. Otherwise, "Keystone" is a stable and uniform variety in appearance and performance across several generations ( $F_4$  to  $F_{10}$ ) and growing conditions.

#### **18.b. Exhibit B. Statement of Distinctness**

Keystone is most similar to the variety Sharpshooter. However, Keystone has a mid dense, tapering head compared to the lax, strap shaped head of Sharpshooter (Figure 2). Also, Keystone has glumes with medium-long beaks compared to Sharpshooter's beaks of medium length (Figure 3). Keystone has a creamy light tan color at maturity (Royal Horticultural Chart – Orange Buff 507/3, Figure 4) in comparison to Sharpshooter which has a tan color at maturity (Royal Horticultural Chart – Egyptian Buff 407/1, Figure 4). Additionally, Keystone has ovate shaped seed while Sharpshooter has elliptical shaped seed.

The above comparison, along with the complete Objective Description (Exhibit C) shows Keystone to be a novel variety of hard red spring wheat.

**Table 1. Agronomic characteristics of Keystone compared to check varieties in Western Plant Breeders' trials 1998-2000 (average of 12 locations).**

Variety	Yield -bu/ac-	Test Weight -lbs/bu-	Protein -%-	Sed -mm-	Heading Date -from 6/1-	Height -in-	Stem Rust	Leaf Rust	Foliar Disease	Scab Tombstones -%-
Keystone	61.1	58.1	13.9	123.0	32.8	34.5	R	R-MR	MR	0.5
Sharpshooter **	48.8	56.2	14.2	108.3	31.0	35.1	R	MR	MR-MS	0.9
Lars	49.7	53.8	14.4	122.0	37.1	28.0	R	MR	MR-MS	3.7
Russ	55.9	56.0	14.3	124.5	32.7	33.9	R	MR-MS	MS	2.7
Overall Average	53.9	56.0	14.2	119.5	33.4	32.9				2.0
STDEV	12.3	3.5	0.7	8.3	3.7	2.9				2.3
**Sharpshooter is the scab resistant check variety.										

Table 2. Agronomic characteristics of Keystone (FA 998-743) and other HRSW varieties. Commercial checks are Verde, Keene and 2375. LSD = 0.05 level.

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Table 3-1. ALL LOCATION MEANS FOR UNIFORM REGIONAL HRSW NURSERY 2000

SORTED BY YIELD, DESCENDING

VARIETY OR Shattering*	YIELD	TWT	HD	HT	LD	STEMRUST*	LEAFRUST*	DS*
STATE NO.	BU/AC	LB/BU	DAYS	CM				
NO. LOCS:	17	16	14	17	7	1	1	1
SD3348	60.8	59.5	22	90	2.8		5MR	33 02
N96-0144	60.6	59.8	25	83	1.9		TR	28 TR
SD3367	60.6	60.5	22	87	1.9		TR	28 04
MN97803	58.9	59.7	23	85	1.9		TMR	33 01
MN97448	58.2	60.7	24	83	2.1		10MS	28 00
SD3496	58.1	60.2	21	90	1.9		5MR	30 01
ND726	58.1	62.0	22	97	3.0		TMS	25 TR
N97-0090	58.0	59.9	25	78	1.1		5MR	28 TR
VERDE	57.9	58.9	26	84	1.5		10MS	23 TR
N96-2444	57.8	60.3	24	98	1.7	TS	10MS	28 00
ND729	57.8	61.2	24	102	2.3		TR	28 01
SD3522	57.6	60.0	22	93	2.2	5S	TMR	33 05
FA998-743	57.3	60.9	24	91	2.6		10MS	25 23
MN95229	57.1	60.9	23	82	1.6		10MS	30 TR
SD3506	57.1	61.3	24	95	2.1		TR	25 00
98S0191-60	56.6	59.3	25	94	2.5		TR	35 00
98T379	56.4	58.8	29	89	1.8		10MS	38 00
ND721	56.1	60.8	24	94	1.9		5R	30 01
ND709-9	56.0	60.5	24	91	1.3		TR	40 01
KEENE	55.8	60.1	25	104	2.2		TR	28 TR
BW259	55.2	59.4	24	96	2.3		20S	45 01
SLW97606	55.1	61.4	26	84	0.6	TS	20S	30 00
N99-0010	55.0	60.1	23	79	2.3		10MS	43 00
98T311	54.8	58.6	27	90	1.6		20S	25 00
2375	54.1	60.0	24	88	3.1		40S	55 01
MN97073	53.8	59.8	23	78	1.2		5MR	38 TR
WA007839	53.6	58.4	23	81	2.2		30S	38 00
ND724	53.5	59.3	25	98	2.5		TMR	20 TR
WA7859	52.5	57.8	24	96	2.5		20S	40 00
98S0191-22	51.7	59.3	23	90	1.6		TR	33 00
ID0560	51.3	55.2	27	84	1.4		40S	68 00
BW270	50.8	60.0	25	100	3.0		TMR	40 00
CHRIS	43.1	58.2	26	105	5.2		30S	48 TR
MARQUIS	38.5	57.7	27	109	4.3	5MS-S	50S	80 TR
MEANS:	55.3	59.7	24	91	2.2			
TESTS	YIELD	TWT	HD	HT	LD			
F-test:	11.5	15.6	34.3	77.2	5.8			
LSD:	3.7	0.9	0.8	2.5	1.0			
CV:	9.9	2.2	4.5	4.2	43.9			

\* Stemrust=St. Paul; Leafrust=Minot; DS and Shattering=Prosper

Table 3. Stem rust reactions of Keystone (FA 998-743) and other HRSW varieties.

Table 4-1. Adult stem rust reactions of entries in the 2000 Uniform Regional Hard Red Spring Wheat Nursery. [USDA-ARS, NDSU ( Miller, Rasmussen)]

Entry No.	Cultivar or Line	Percent Severity and Reaction		
		Fargo	Carrington	Langdon
1	Marquis	30-40MSS	5-10MSS	1-5S
2	Chris	0,30MS	0-1MSS	0
3	2375	0	0	
4	Verde	15S		
5	Keene	0		
6	SD3367	20RMR		
7	SD3498	5R		
8	SD3508	15R		
9	SD3348	10RMR		
10	SD3522	1R,25MSS		
11	MN97073	0		
12	MN97448	0		
13	MN97803	1R		
14	MN95229	10R,5MR		
15	ND709-9	0		
16	ND729	1R		
17	ND721	0		
18	ND724	10R		
19	ND726	1R		
20	N96-0144	1R,10MRMS		
21	98S0191-22	5R		
22	98S0191-60-8	15R		
23	N96-2444	20MRMSS		
24	N97-0090	0		
25	N99-0010	20-40MR		
26	FA998-743	1RMR,25MRMS		
27	SLW97608	20RMR		
28	98T311	5R		
29	98T379	1R		
30	ID0560	15R,20MRMS		
31	WA7859	10RMR		
32	WA7839	1R	0	0
33	BW259	1R	0	0
34	BW270	1R		
	Bart (CK)	50S	10S	20S

Date of Planting - Fargo; 5/3/00, Carrington; 4/28/00, Langdon; 4/25/00.

Reading - made at dough stage.

Natural inoculum - plus additional inoculum of pathotypes:

Pgt - TMLK, - TPMK, - RTQQ, - QFCQ and - QTHJ at Fargo.

Comma - separation of plants into two or more reaction classes (segregation or seed mixture).

Dash - range in severity between plants with the same reaction.



Table 4. Leaf rust reactions of Keystone (FA 998-743) and other HRSW varieties.

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Table 4-2 Adult leaf rust reactions of entries in the 2000 Uniform Regional Hard Red Spring Wheat Nursery.  
[ USDA-ARS, NDSU (Miller, Rasmussen)]

Entry No.	Cultivar or Line	Percent Severity and Reaction			C.I.*
		Fargo	Carrington	Langdon	
1	Marquis	60S	40S	30S	43.3
2	Chris	20S-20MS	20MS-10MR	10S-5MS	23.3
3	2375	30S	40MS-20MR	20MS	28.7
4	Verde	10MR	10MR-5MS	1MR	4.1
5	Keene	5R	10R	5R	1.3
6	SD3367	10MR-5MS-tS	5R	10R	3.8
7	SD3498	5R	10R-10MS	5R	4.0
8	SD3506	1MR	10R	1MR	0.8
9	SD3348	10R	5MS	5R-1MR	2.4
10	SD3522	5R	5MR	1MR	1.1
11	MN97073	5MR	5MR-1MS	10R	2.1
12	MN97448	1MR	10R-1MR-1MS	1MR	1.1
13	MN97803	5R	10MR-1MS	5R	2.5
14	MN95229	5MR-5MS	10R-1MR	10R	3.4
15	ND709-9	5R	1MR	1MR	0.5
16	ND729	10MR	1MR	10R	2.1
17	ND721	1MR	1MR	1MR	0.2
18	ND724	1MR	5R-SEG	5R	0.7
19	ND726	5R	10R-SEG	1MR	1.1
20	N96-0144	5R	10R	1MR	1.1
21	98S0191-22	10MR-1MS	5R	10R	2.5
22	98S0191-60-8	5R	5R	10R	1.3
23	N96-2444	20MS-tS	10MS	1MR	8.2
24	N97-0090	5R	10R-10MR	5R	2.7
25	N99-0010	10R	10R	5R	1.7
26	FA998-743	10MR-1MS	10R-1MR	1MR	2.3
27	SLW97606	30MS	10MS	10MS	16.0
28	98T311	5R	10MR	10MS-1MR	7.1
29	98T379	5MS-5MR	10R-10MR	10R	4.7
30	ID0560	40S-20MS	60S	20S-20MS	50.7
31	WA7859	5MR	5R	10R	1.7
32	WA7839	10R	10MR	5R	2.3
33	BW259	5MR-tS	20MS-tS	1MS	6.3
34	BW270	1MR	10R-10MR	10R	2.7
	Baart (CK)	70S	80S	40S	63.3

\* C.I. - Average coefficient of infection. Percent severity multiplied by the following values for reaction types: R = 0.2, MR = 0.4, MS = 0.8, S = 1.0, t = 0.5. Multiplication carried out for each reporting station and then an average is taken across stations.

Date of Planting - Fargo; 5/3/00, Carrington; 4/28/00, Langdon; 4/25/00.

Table 5. *Fusarium* head blight reactions of Keystone (FA 998-743) and other HRSW varieties. Bacup and McVey are the scab resistant check varieties.

35

Table 4-6. Mean *Fusarium* head blight reactions over three locations, MN, 2000

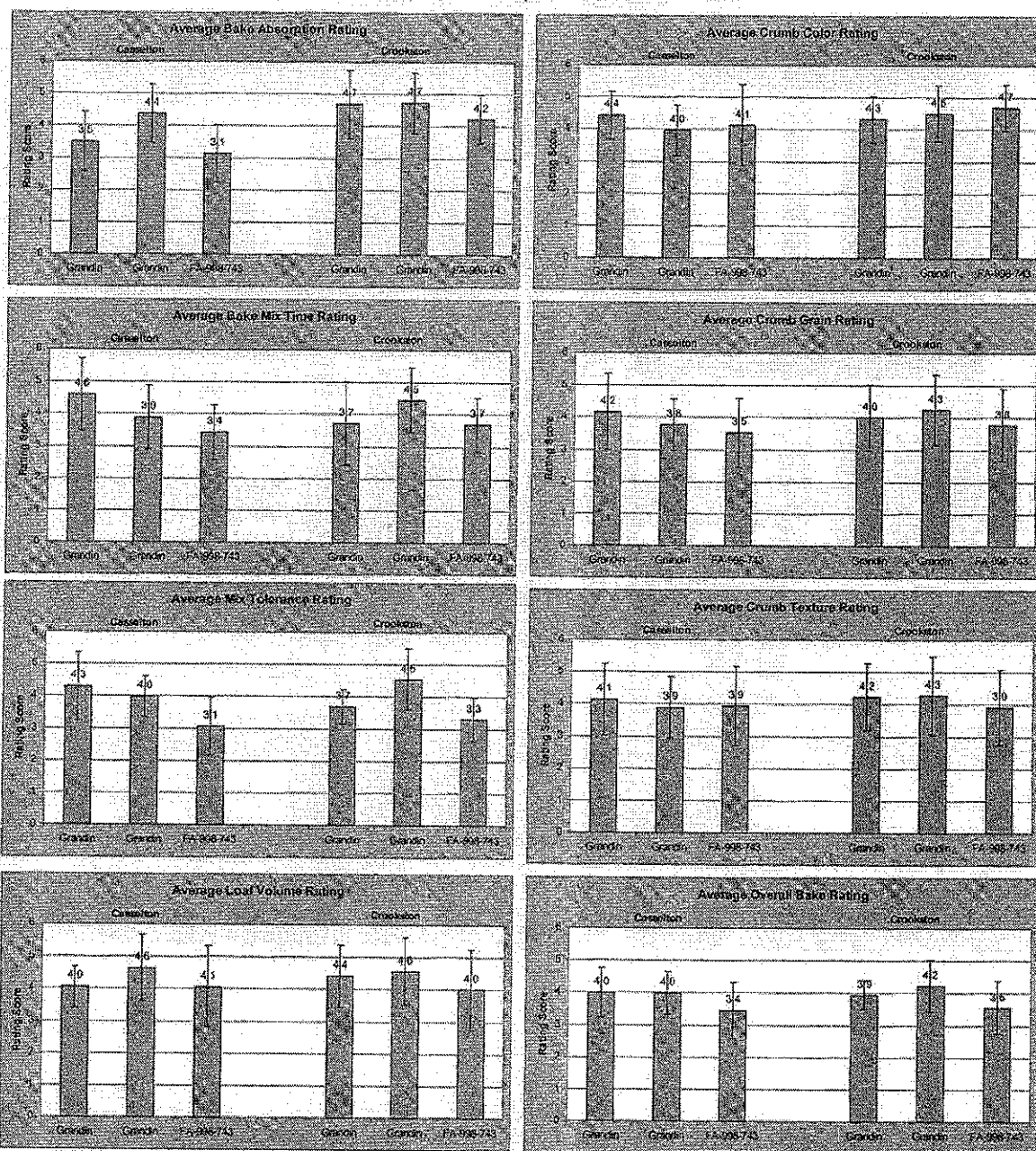
Line	Heading Date	Incidence %	Severity %	Disease %	Yield (g/plot)	Tombstone %	DON ppm
BACUP	23.9	79.5	21.2	17.9	118.4	8.3	10.7
MARQUIS	28.5	98.3	43.2	42.7	91.7	18.3	16.8
CHRIS	29	97.6	41.4	40.6	67.6	22.8	19
2375	28.1	93.9	40.1	37.6	126.2	13.1	14
VERDE	29.3	98.3	46.5	45.8	88.3	19.5	18.6
KEENE	27.6	94.4	40.8	39.4	127.6	14.7	18.4
SD3367	25.3	92.2	34	32.7	128.6	15.6	14
SD3496	23.8	94.4	33.2	32	152.4	15	15.4
SD3506	27.6	96.7	34.8	34.2	134.9	13.8	14.5
SD3348	24.3	91.1	34.3	32.7	178.8	11.5	9.7
SD3522	25.7	83.3	27.9	24.8	173.2	14.5	15.7
MN97073	26.1	92.8	34.4	32.6	105.4	16.2	19.6
ROBLIN	24.6	99.4	50.4	50.2	105.8	22.7	21.5
MN97448	27.3	97.8	58	57.5	89.1	22.5	18.7
MN97803	25.6	93.9	35.7	33.9	138.8	15.6	19.3
MN95229	26.8	96.1	39.5	38.8	111.7	13.9	13.8
ND709-9	26.9	87.8	23.6	22.1	130.2	9.6	9.8
ND729	27.8	97.8	40.6	40	129.4	11.7	14.3
ND721	26.9	84.4	33.8	31.4	121.3	12.9	11.5
ND724	27.9	92.8	40.9	38.3	108	15.3	16.7
ND726	26.4	80.6	30.5	27.3	143.3	10.6	8.7
N96-0144	28.2	98.9	36.5	36.2	107.6	16.1	13.6
98S0191-	26.2	98.9	59.9	59.5	93.7	21.9	22.7
9820191-6	27.6	94.4	53.8	52	92.3	19	18.3
N96-2444	26.9	91.7	29.4	27.6	147.6	10	10.5
WHEATO	28.2	100	69.7	69.7	70	41.7	34.2
N97-0090	26.7	82.8	39.7	37.4	126.2	15.9	13
N99-0010	26.7	97.2	42.9	42.5	107.2	9.9	10.9
FA998-743	26.9	82.2	31.2	29	145.8	9.7	10.7
SLW9760	28.1	97.8	44.1	43	109.1	17.1	15.2
98T311	30.9	98.9	38.9	38.6	60.8	16.2	17.2
98T379	30.8	99.4	39.6	39.5	85.3	17.5	13.4
ID0560	30.6	97.8	60.5	59.9	60.4	36.9	35.8
WA7859	26.5	95	47	45.7	89.1	23.2	26.7
WA7839	26.2	98.9	49.4	49	84.4	19.9	20.1
BW259	26.2	97.2	44.8	43.9	121.9	15.2	15.2
BW270	27.3	97.8	39.4	38.5	131.1	10.6	10.7
MCVEY	30.1	87.7	25.8	23.2	154.7	10.1	16.1
MEAN	27.2	93.7	40.5	39.1	114.7	16.6	16.4
LSD	1.6	16.2	18.4	20	41.6	9.4	10.4

**Figure 1. Baking properties of Keystone grown at two locations in the 2000 Wheat Quality Council Trials. Ratings between 3 and 4 are indicative of acceptable quality. Higher ratings are considered superior.**

### Baking Properties

**FA-998-743**

**Casselton – C11, Crookston – K11**



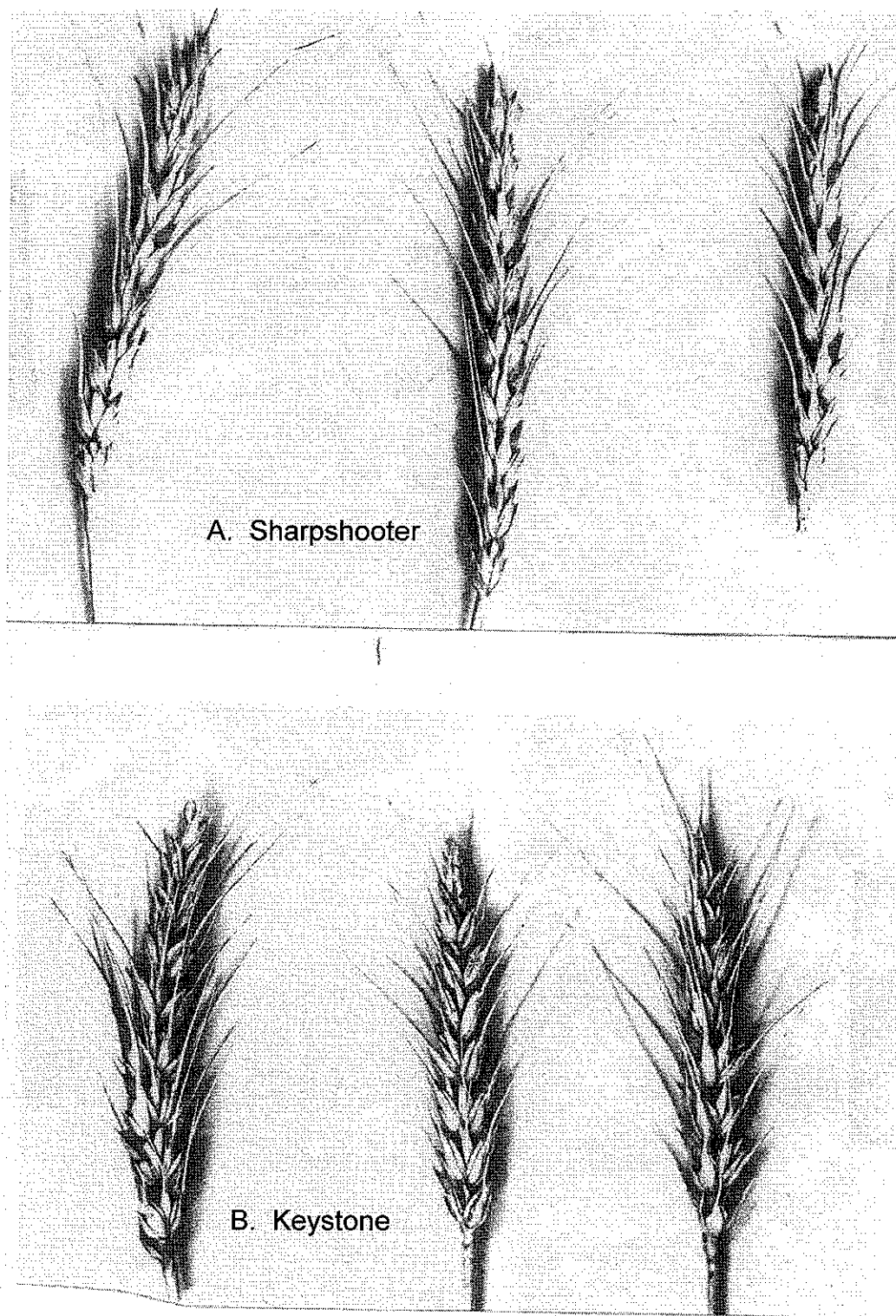


Figure 2. Comparison of typical heads of Sharpshooter (A) and Keystone (B).

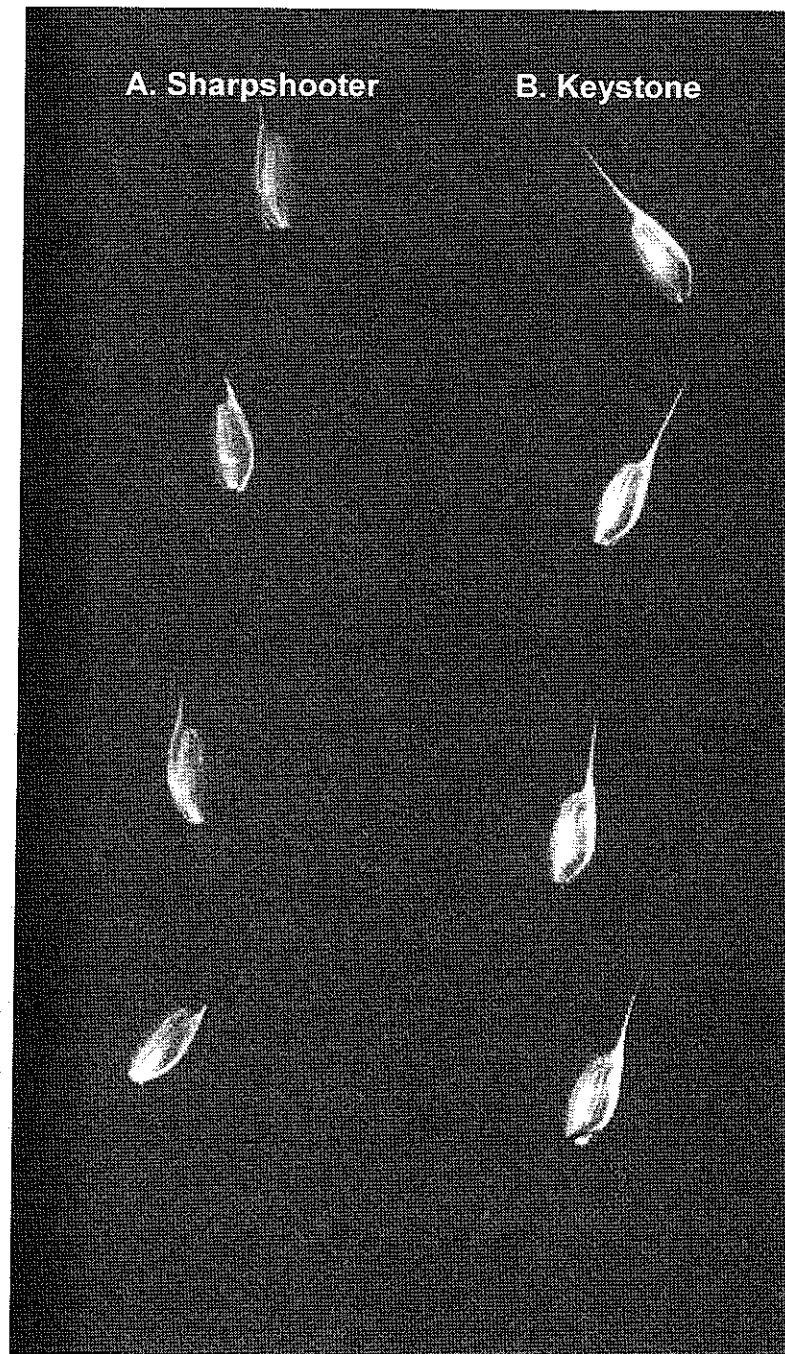


Figure 3. Comparison of typical glume beaks of Sharpshooter (A) and Keystone (B).

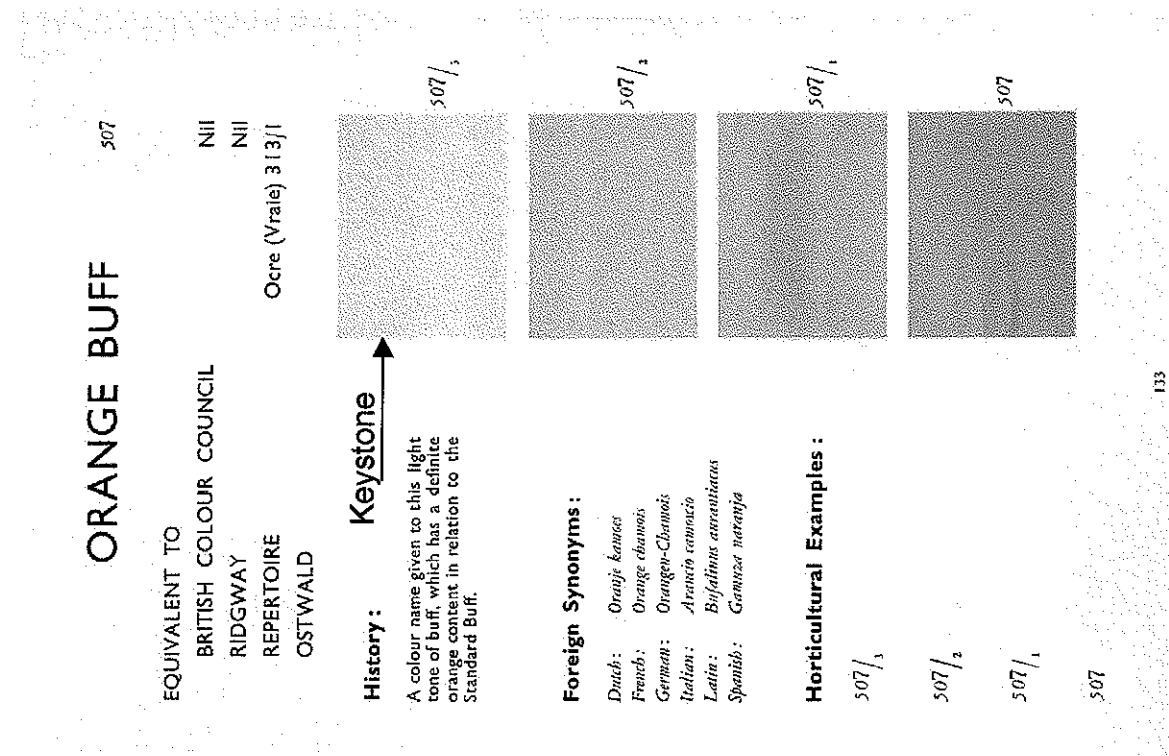
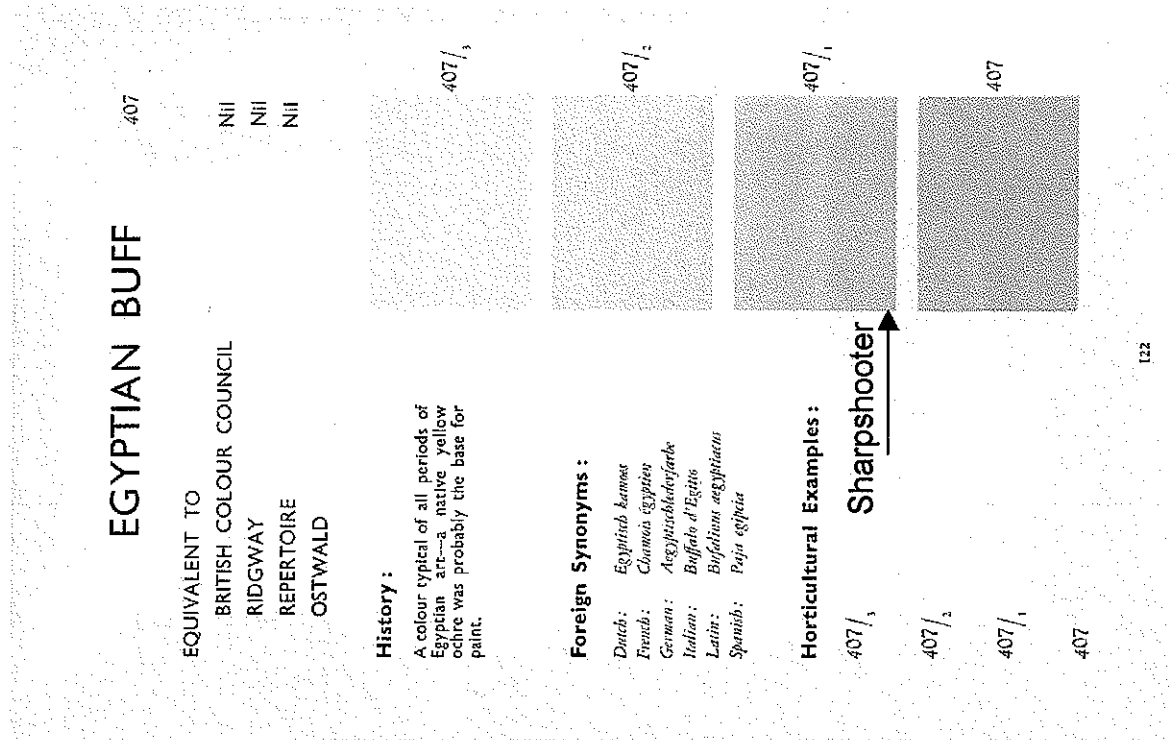


Figure 4. Pages taken from the Horticultural Colour Chart published by the British Colour Council, 1938.



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Form Approved - OMB No. 0581-0055

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U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
SCIENCE AND TECHNOLOGY  
PLANT VARIETY PROTECTION OFFICE  
BELTSVILLE, MD 20705

EXHIBIT C  
(Wheat)

**OBJECTIVE DESCRIPTION OF VARIETY  
WHEAT (*Triticum* spp.)**

NAME OF APPLICANT(S)  Western Plant Breeders, Inc.  ADDRESS (Street and No. or RD. No., City, State, and Zip Code)  8111 Timber line Dr. Bozeman, MT 58718-8184	FOR OFFICIAL USE ONLY
	PVPO NUMBER  2001 00 256
	VARIETY NAME  Keystone
	TEMPORARY OR EXPERIMENTAL DESIGNATION  FA 998-743

**PLEASE READ ALL INSTRUCTIONS CAREFULLY:** Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g.    or   ) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used. Please answer all questions for your variety; lack of response may delay progress of your application.

**1. KIND:**

1=Common      2=Durum      3=Club      4=Other (SPECIFY): \_\_\_\_\_

**2. VERNALIZATION:**

1=Spring      2=Winter      3=Other (SPECIFY): \_\_\_\_\_

**3. COLEOPTILE ANTHOCYANIN:**

1=Absent      2=Present

**4. JUVENILE PLANT GROWTH:**

1=Prostrate      2=Semi-erect      3=Erect

**5. PLANT COLOR (boot stage):**

1 = Yellow-Green      2 = Green      3 = Blue-Green

**6. FLAG LEAF (boot stage):**

1 = Erect      2 = Recurved       1 = Not Twisted      2 = Twisted

**7. EAR EMERGENCE:**

Number of Days Earlier Than Lars \*

Number of Days Later Than Sharpshooter \*

## 8. ANTHOR COLOR:

1 = Yellow

2 = Purple

## 9. PLANT HEIGHT (from soil to top of head, excluding awns):

cm Taller Than Larscm Shorter Than Sharpshooter

\* Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

## 10. STEM:

## A. ANTHOCYANIN

1 = Absent

2 = Present

## B. WAXY BLOOM

1 = Absent

2 = Present

## C. HAIRINESS (last internode of rachis)

1 = Absent

2 = Present

## D. INTERNODE (SPECIFY NUMBER)

1 = Hollow

2 = Semi-solid

3 = Solid

## E. PEDUNCLE

1 = Absent

2 = Present

 cm Length

## 11. HEAD (at Maturity):

## A. DENSITY

1 = Lax

2 = Middense

3 = Dense

## B. SHAPE

1 = Tapering

2 = Strap

3 = Clavate

4 = Other (SPECIFY): \_\_\_\_\_

## C. CURVATURE

1 = Erect

2 = Inclined

3 = Recurved

## D. AWNEDNESS

1 = Awnless

2 = Apically Awnletted

3 = Awnletted

4 = Awned

## 12. GLUMES (at Maturity):

## A. COLOR

1 = White

2 = Tan

3 = Other (SPECIFY): \_\_\_\_\_

## C. BEAK

1 = Obtuse

2 = Acute

3 = Acuminate

## B. SHOULDER

1 = Wanting

2 = Oblique

3 = Rounded

4 = Square

5 = Elevated

6 = Apiculate

## D. LENGTH

1 = Short

2 = Medium

(ca. 7mm)

(ca. 8mm)

3 = Long (ca. 9mm)



12. GLUMES (at Maturity) *Continued*:

## E. WIDTH

- ☒ 2 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm)  
3 = Wide (ca. 4mm)

## 13. SEED:

## A. SHAPE

- ☒ 1 1 = Ovate 2 = Oval 3 = Elliptical

## C. BRUSH

- ☒ 2 1 = Short 2 = Medium 3 = Long

- ☒ 1 1 = Not Collared 2 = Collared

## B. CHEEK

- ☒ 1 1 = Rounded 2 = Angular

## D. CREASE

- ☒ 1 1 = Width 60% or less of Kernel  
2 = Width 80% or less of Kernel  
3 = Width Nearly as Wide as Kernel

- ☒ 1 1 = Depth 20% or less of Kernel  
2 = Depth 35% or less of Kernel  
3 = Depth 50% or less of Kernel

## E. Color

- ☒ 3 1 = White 2 = Amber 3 = Red  
4 = OTHER (Specify)

G. PHENOL REACTION (*see instructions*):

- ☐ 1 = Ivory 2 = Fawn  
3 = Light Brown 4 = Dark Brown  
5 = Black

## F. TEXTURE

- ☒ 1 1 = Hard 2 = Soft

## 14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

## PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

- ☒ 2 Stem Rust (*Puccinia graminis* f. sp. *tritici*)  
Prevalent races

- ☒ 2 Leaf Rust (*Puccinia recondita* f. sp. *tritici*)  
Prevalent races

- ☒ 1 Stripe Rust (*Puccinia striiformis*)  
Prevalent races

- ☒ 0 Loose Smut (*Ustilago tritici*)

- ☒ 4 Tan Spot (*Pyrenophora tritici-repentis*)  
Prevalent races

- ☒ 0 Flag Smut (*Urocystis agropyri*)

- ☒ 0 Halo Spot (*Selenophoma donacis*)

- ☒ 0 Common Bunt (*Tilletia tritici* or *T. laevis*)

- ☒ 0 *Septoria nodorum* (Glume Blotch)

- ☒ 0 Dwarf Bunt (*Tilletia controversa*)

- ☒ 0 *Septoria avenae* (Speckled Leaf Disease)

- ☒ 0 Karnal Bunt (*Tilletia indica*)

- ☒ 4 *Septoria tritici* (Speckled Leaf Blotch)

- ☒ 0 Powdery Mildew (*Erysiphe graminis* f. sp. *tritici*)

- ☒ 4 Scab (*Fusarium* spp.)

- ☒ 0 "Snow Molds"

14. Disease (Continued) (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

- |   |   |
|---|---|
| <input type="checkbox"/> "Black Point" (Kernel Smudge)              | <input type="checkbox"/> Common Root Rot ( <i>Fusarium</i> , <i>Cochliobolus</i> and <i>Bipolaris</i> spp.) |
| <input type="checkbox"/> Barley Yellow Dwarf Virus (BYDV)           | <input type="checkbox"/> Rhizoctonia Root Rot ( <i>Rhizoctonia solani</i> )                                 |
| <input type="checkbox"/> Soilborne Mosaic Virus (SBMV)              | <input type="checkbox"/> Black Chaff ( <i>Xanthomonas campestris</i> pv. <i>translucens</i> )               |
| <input type="checkbox"/> Wheat Yellow (Spindle Streak) Mosaic Virus | <input type="checkbox"/> Bacterial Leaf Blight ( <i>Pseudomonas syringae</i> pv. <i>syringae</i> )          |
| <input type="checkbox"/> Wheat Streak Mosaic Virus (WSMV)           | <input type="checkbox"/> Other (SPECIFY)  |
| <input type="checkbox"/> Other (SPECIFY)                            | <input type="checkbox"/> Other (SPECIFY)  |
| <input type="checkbox"/> Other (SPECIFY)                            | <input type="checkbox"/> Other (SPECIFY)  |
| <input type="checkbox"/> Other (SPECIFY)                            | <input type="checkbox"/> Other (SPECIFY)  |

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

- |  |  |
|--|--|
| <input type="checkbox"/> Hessian Fly ( <i>Mayetiola destructor</i> )                       | <input type="checkbox"/> Other (SPECIFY) |
| <input checked="" type="checkbox"/> Stem Sawfly ( <i>Cephus</i> spp.)<br>Has a Hollow Stem | <input type="checkbox"/> Other (SPECIFY) |
| <input type="checkbox"/> Cereal Leaf Beetle ( <i>Oulema melanopa</i> )                     | <input type="checkbox"/> Other (SPECIFY) |
| <input type="checkbox"/> Russian Aphid ( <i>Diuraphis noxia</i> )                          | <input type="checkbox"/> Other (SPECIFY) |
| <input type="checkbox"/> Greenbug ( <i>Schizaphis graminum</i> )                           | <input type="checkbox"/> Other (SPECIFY) |
| <input type="checkbox"/> Aphids  | <input type="checkbox"/> Other (SPECIFY) |

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE**EXHIBIT E**  
**STATEMENT OF THE BASIS OF OWNERSHIP***The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552e) and the Paperwork Reduction Act (PRA) of 1995.**Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).*

1. NAME OF APPLICANT(S)  Western Plant Breeders, Inc.	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER  FA 998-743	3. VARIETY NAME  Keystone
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country)  8111 Timberline Drive Bozeman, MT 59718-8184	5. TELEPHONE (include area code)  (406) 587-1218	6. FAX (include area code)  (406) 586-8247
7. PVPO NUMBER  200100256		

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain. ☒ YES ☐ NO9. Is the applicant (individual or company) a U.S. national or U.S. based company? ☒ YES ☐ NO  
If no, give name of country10. Is the applicant the original owner? ☒ YES ☐ NO If no, please answer one of the following:

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?

☐ YES ☐ NO If no, give name of country

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (if needed, use reverse for extra space):

**PLEASE NOTE:**

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

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